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ABSTRACT

When it commenced operation in 1971, the Nacimiento Copper Mine provided 135 new jobs. This was about half of the 278 new permanent jobs created in Cuba, New Mexico, from 1970 to 1974. Concurrent and independent development of the Checkerboard Health Clinic and expansion of the school system accounted for most of the remaining new employment. Population of Cuba and the immediate surrounding area increased some 55 percent from 819 to about 1,270. Average personal income increased substantially over the period. Gross business receipts increased from an average of $125,000 per month in 1969-70 to more than $300,000 per month since 1971. A few new businesses were established and many were expanded or improved their appearance with new facades. Most community services handled the increased population with minimum strain. Exceptions were the water and sewage systems. Municipal revenues increased rapidly enough to allow the city to operate in the black every year. Municipal officials, school administrators, mine officials, businessmen, ranchers, teachers, clergy, students, retirees, civic groups, and others were almost unanimous in their favorable reactions to the Nacimiento Mine operation. Some relatively minor reservations and concerns were expressed. Most Cuba residents favored development on the scale of that since 1970. (Author/NQ)

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Impact of Mining Development on an Isolated Rural Community: *The Case of Cuba, New Mexico*

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NEW MEXICO STATE UNIVERSITY

AGRICULTURAL EXPERIMENT STATION • RESEARCH REPORT 301

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SUMMARY

Domestic energy development has recently become a first-order national priority. Large-scale coal developments promise to transform somnolent villages into bustling centers of activity almost overnight. There is growing public concern over the socioeconomic impacts of such developments, which involve economic benefits but also social costs. Objectives of the study reported here were to describe the effects of a recently established mining operation on Cuba, New Mexico, and the residents' attitudes toward recent and future development.

When it commenced operation in 1971, the Nacimiento Copper Mine provided 135 new jobs. This was about half of the 278 new permanent jobs created in Cuba from 1970 to 1974. Concurrent and independent development of the Checkerboard Health Clinic and expansion of the school system accounted for most of the remaining new employment. Population of Cuba and the immediate surrounding area increased some 55 percent from 819 to about 1270. Average personal income increased substantially over the period. Gross business receipts increased from an average of $125,000 per month in 1969-70 to more than $300,000 per month since 1971. A few new businesses were established and many were expanded or improved their appearance with new facades. Most community services handled the increased population with minimum strain. Exceptions were the water and sewage systems. Municipal revenues increased rapidly enough to allow the city to operate in the black every year.

Municipal officials, school administrators, mine officials, businessmen, ranchers, teachers, clergy, students, retirees, civic groups, and others were almost unanimous in their favorable reactions to the Nacimiento Mine operation. Some relatively minor reservations and concerns were expressed. Most Cuba residents favor development on the scale of that since 1970.

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NOTE: As this goes to publication, the Nacimiento Mine operations were suspended due to declining copper prices. The length of the shutdown will depend, of course, on a reversal of that market situation. The authors intend to monitor the unfolding events in Cuba and possibly to do a follow-up study, should that become appropriate and resources permit it.

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Impact of Mining Development on an Isolated Rural Community: *The Case of Cuba, New Mexico*

*Berry Ives and Clyde Eastman**

Development of domestic energy resources is currently the subject of a great deal of attention. In particular, the development of the Nation's coal resources is thought by many to be at least a short-term solution to the problem of providing a supply of cheap energy. Among these coal resources, the greatest development potential is in the north-central and southwestern states, where there are huge deposits of strippable coal. The coal, after it is mined, will be used to produce electricity or synthetic natural gas. The coal mining and processing industries will create large new centers of employment in relatively small communities heretofore unaccustomed to industrial developments on this scale. Of growing public concern is the impact which the influx of hundreds or thousands of new residents will have on such communities.

One New Mexico community which is likely to experience the impact of coal mining development is Cuba, a small, rather isolated village in the north-central part of the state (figure 1). Cuba is the only service center within commuting distance of the Star Lake Coal Field to the west. Future mining developments in this area would likely impact heavily on Cuba.

Cuba has already experienced the impact of the development of a surface mining operation which is substantially smaller than the potential coal mining operations. This was the Nacimiento Copper Mine, owned by Earth Resources Company, which began operations in 1971. The study reported here describes the impact of this recent development. The description may prove useful in projecting the impact of future mining developments.

The objectives of the study were to 1) describe the effects of a recently established mining operation on an isolated rural community, and 2) describe the attitudes which community leaders and other representative persons have towards recent and future developments. The study was part of a much broader, more comprehensive study of coal mining developments in New Mexico.

CUBA AND ENVIRONS

Geography

Cuba lies at the source of the Rio Puerco, a tributary of the Rio Grande. It is situated on the western boundary of the Santa Fe National Forest. Several miles north of Cuba are two smaller settlements, La Jara and Regina. Taken together with adjacent areas, these communities include virtually all of the non-Indian population of the Cuba census division.

At an elevation of about 6,905 feet, Cuba is surrounded by rolling hills predominantly vegetated with piñon pine and juniper, but including a wide variety of flora. The San Pedro Mountains to the immediate east and Jemez Mountains to the southeast include ponderosa pine and oak and rapidly climb into alpine vegetation characterized by fir and spruce (figure 2). Nacimiento Peak, within five miles of Cuba, has an elevation of 9,801 feet. Beyond the Santa Fe Forest to the west are semiarid grasslands dominated by blue grama, dropseed, Indian rice grass and green joint-fir. Grazing disturbances have resulted in a relative abundance of tumbleweed in some areas. The rolling grasslands are accented by outcroppings of rock, with lower areas and washes more heavily vegetated, but frequently marked by arroyos where saltbush and rabbit brush are found [1].

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Fig. 1. Map of Cuba and New Mexico

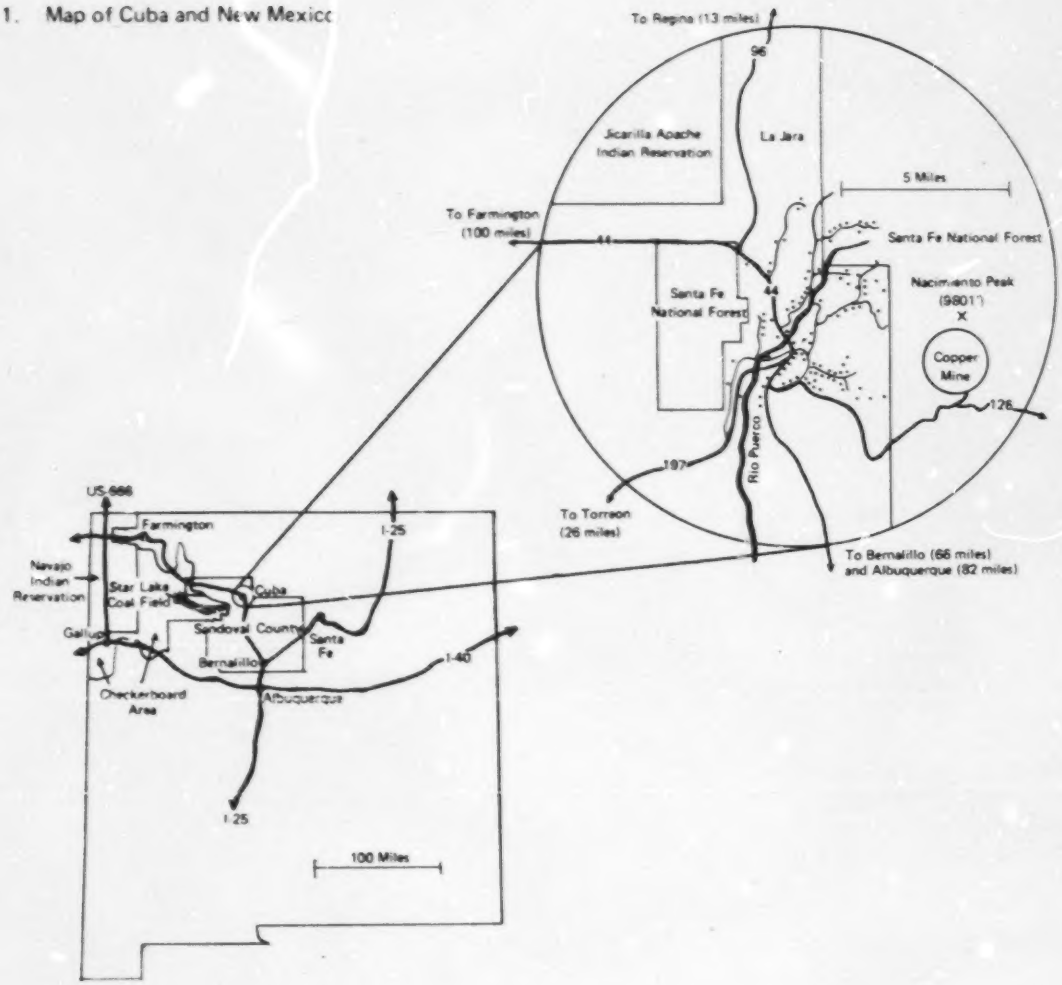
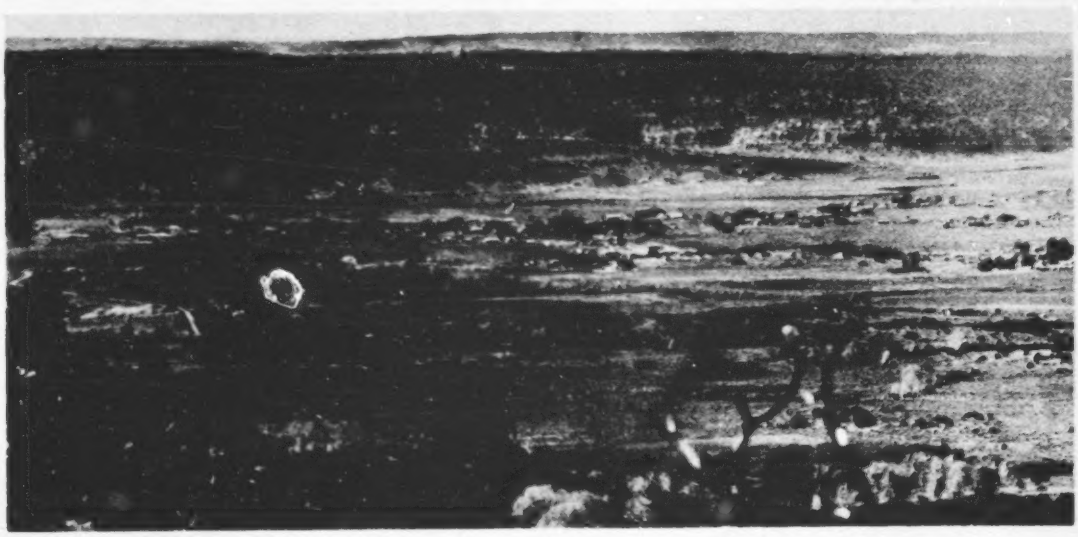


Fig. 2. Cuba and environs



The climate varies as greatly as the geography. Average annual precipitation at Cuba is about 16 inches; in the mountains to the east, it ranges from 20 to 40 inches per year; and in the grasslands to the west, it averages 10 to 14 inches. The average frost-free season is about 100 days from late June to late September; average sunshine is about 70 percent of possible [8]. Cuba, sandwiched between forests to the east and grasslands to the west, lies between two interesting and contrasting environments. No less interesting is the area's history.

History

The Upper Puerco drainage was a grassy wilderness in 1845...and the Rio Puerco was a small permanent creek of clear water and willow-lined banks. A few Apache Indians to the north, the Navajos to the west, a few hunters and trappers from Bernalillo, and occasional sheepherders with small bands of sheep from Los Padillas, south of Albuquerque, were the only users of the area (10, p. 7)

By 1870 most of the Upper Puerco drainage was under the effective control of two cousins, Mariano Otero and Mariano Perea. The former ran 90,000 sheep and 9,000 cattle while the latter ran 150,000 sheep [10]. About the same time small farmers began to settle along the Rio Puerco. They diverted irrigation water from the river and many got into livestock production on the "partido" (share) basis with the two big operators.

Cabezon, about 25 miles south of Cuba, was a flourishing trading center, with three stores and seven saloons by 1890; the lands on the Nacimiento and Leche Creeks at Cuba were well settled...(10, p. 13). Cuba was developing rapidly, and by 1900 had become a wheat and corn growing center (10, p. 14).

...The Spanish-American settlers in the Cuba Valley must have imagined a permanent resource in the fertile soil and the silt-free water of the valley. And yet, within a comparatively few years after settlement the process of deterioration set in. The clear waters muddied; the Puerco and its tributaries began to cut into the ground. The river channel which had formerly carried water to the surrounding land now began to drain them. Springs became wells. Settlements were abandoned, and moved to less damaged areas (10, p. 18).

...The excessive numbers of stock which had been on the ranges...had already sealed the doom of the area by destroying the grass cover on the dark, easily eroded soil. The farm operations in the area were then, and have continued to be to this day, more or less supplementary to the grazing of sheep and cattle, upon which activity the people depended for the bulk of their cash income (10, p. 14).

In more recent times, the small agricultural operations have been supplemental to wage income.

During World War I, substantial quantities of oats and other grains were exported from the area. By the middle '20s, declining production failed even to supply the local feed grain market. Food production was also inadequate for local needs. Most communities had their own schools, the last of which were consolidated into the Cuba system in the 1950s.[1] The gradual decline has continued to the present. Only a few houses remain in the once thriving communities.

In the first three decades of the twentieth century, there were a number of logging and coal mining operations between Bernalillo and Cuba. A railroad, originally planned as a through line to the San Juan Basin and Salt Lake City, was built to within a few miles of Cuba. At least four mines shipped coal out of La Ventana (about 13 miles south of Cuba) for several years. The railroad was taken out at the beginning of World War II.[2]

The village was first named Nacimiento, meaning "source of a river or spring." The name was changed to Cuba in 1887, when the post office was established [6]. Much evidence of Spanish New Mexico remains in Cuba, in place names, family names, language, food, and in the architecture. Long-time traces of Anglo influence are also abundant. The old hotel in figure 3 along with its owner typify the cultural melange in Cuba.

[1] Personal communication with Mr. Walter Hernandez, long-time Cuba resident.
[2] Ibid.

Fig. 3. A Cuba landmark operated as a hotel, bus depot and photo studio.

The People

Cuba is located in Sandoval County, which had a 1970 population of 17,492. Sandoval County had only 1.7 percent of the state's population in 1970, compared with 2.6 percent in 1930. This indicates a growth rate substantially below the state average [3]. The village of Cuba had a 1970 population of 416, although inclusion of its periphery, La Jara, Regina, and adjacent areas brought this figure up to an estimated 1300. The ethnic breakdown was about 60 percent Spanish-American, 38 percent Anglo-American, and less than 2 percent Native American (Navajo).

The area to the west and southwest of Cuba, known locally as the Checkerboard Area (because of the allocation pattern) is inhabited by Navajo Indians (figure 1). This area is outside the reservation and is mostly government land, the rights to some of which are in dispute. The Navajos have had primarily a subsistence culture, in which grazing sheep, goats, cattle, and horses is a way of life. Some produce jewelry and rugs to be sold for cash. They obtain medical, educational, and other services in Cuba, but very few Navajo have chosen to live there. The Star Lake Coal Field lies entirely within the Checkerboard Area, so any development of this coal would have a major impact on the Navajo.

Economic Activity

Industrial development in the Middle Rio Grande Valley was greatly stimulated in 1880 when the A. T. & S. F. Railroad was built through Bernalillo. A later spur to the La Ventana coal field, a few miles south of Cuba, was plagued with financial difficulties and was repossessed by A. T. & S. F. in 1939 after its third failure. Finally, a washout in 1941 led to its abandonment, and transportation switched to trucks [6].

The primary economic activities of the Cuba area are farming, ranching, lumbering, mining, and recreation. In 1970, farming and ranching within the census division employed an estimated 20 persons, although some use is made of migrant labor, which is not counted [9]. Most of the farms and ranches are 15 to 40 acres; the principal crops are alfalfa or permanent pasture. North and south of Cuba, 836 acres are irrigated by means of intermittent streams.[3] An earlier study indicated that these small farms and ranches about 33 percent of the operators' household income [2].

[3]Personal communication with the Soil Conservation Service, Cuba, New Mexico.

The sawmill industry, with a long history in this area, is still a major source of employment. Ramco Logging Company employs up to 137 people during a good nine-month season. In the winter or during an economic downturn, the company maintains only a skeletal operating crew of 5 to 15 men. Ramco contracts all its production to the Duke City Lumber Company's sawmill, located just outside of Cuba. Duke City normally operates nearly year-round, closing down a few weeks for maintenance. It normally employs about 50 men.

With employment in the lumber industry fluctuating by 150 or more men, the economy of Cuba is very sensitive to, and dependent upon, the general economic situation.

Cuba, due to its isolation, is a service center for many travelers along State Highway 44. In addition, the mountains of the Santa Fe National Forest provide recreational opportunities for the whole range of outdoorsmen, from hunters, fishermen, picnickers, hikers and campers, to backpackers, photographers, geologists, and archeologists. The Boy Scouts, Girl Scouts, and Campfire Girls have permanent camps in the area.

Coal mining has been a commercial operation in the past, but now it is limited to minor domestic usage, principally by Native Americans. With approximately 635 million tons of coal under less than 250 feet of overburden, the Star Lake Area has the potential for major stripmining operations [7]. This represents enough reserves to support two operations on the scale of the Navajo Mine in San Juan County. The direct employment in mining could range up to 700 persons. Others could be employed in transportation to export the coal, probably via a railroad spur which would have to be constructed. In addition, indirect employment in the service sector could increase total new employment to over 1,000. Currently, the only major commercial mining activity in the Cuba area is the Nacimiento Copper Mine. A small mining enterprise which produces a soil conditioner is underway a few miles south of Cuba. It employs only a few people.

DEVELOPMENTS FROM 1970 TO 1974

Nacimiento Copper Mine

The Nacimiento Copper Mine, owned by Earth Resources Company, began operations in 1971. It is located about four miles east of Cuba on National Forest, state, and private lands (figure 1). Processed ore is shipped to El Paso, where it is reduced to copper ingots by American Smelting

and Refining Company (ASARCO). The mine is expected to continue operating until at least 1980 by which time the most attractive ore will be exhausted. The exact terminal date will depend on the price of copper, the quality of remaining ore deposits, and other factors. Figure 4 provides a bird's-eye view of the mine site.

It has been the policy of Earth Resources to hire locally whenever possible. This policy has been most advantageous to local residents and former residents who, according to mine officials, filled over 100 new jobs. Mine employment by skill type, ethnicity, and sex is shown in table 1. While most of the non-professional workers come from within 40 miles of Cuba, the 14 professional staff and some of the technical staff were imported. A mine official indicated that most local men learned well and were good workers, but that training was costly, partially because of a high turnover rate in the work force.

The total area of land expected to be disturbed by mining operations was estimated to be from 640 to 800 acres. Revegetation is required by law on National Forest lands, but not on state or private lands. Under recently enacted legislation, Earth Resources will be required to submit a mining plan to the Forest Service, one part of which will be its reclamation plan. The company does not plan to undertake a comprehensive reclamation program until after mining operations have terminated. Experiments in revegation of stripped areas are currently being conducted.

Table 1. Employment by skill type, ethnicity, and sex at the Nacimiento Copper Mine, Cuba, New Mexico, October, 1974

Item	Labor	Technical and Clerical	Supervisory and Professional	Total
	number			
Total	103	12	20	135
Ethnic groups				
Spanish	90	8	4	102
Anglo	10	4	16	30
Navajo	3	0	0	3
Sex				
Male	103	9	20	132
Female	0	3	0	3

Source: Personal communication with Mr. Keith Elmer, Personnel Manager, Nacimiento Copper Mine, Earth Resources Company, October 17, 1974.

Concurrent Developments

During the same years there have been significant developments other than the mine. One of these

Fig. 4. The Nacimiento Mine

is the growth of the Cuba Independent School System, which would have occurred even without the mine development. This school system serves not only Cuba and the predominantly Spanish and Anglo areas to the north and south of Cuba, but also the Navajo Checkerboard Area to the West. During recent years, the system has been drawing in Navajo students in ever-increasing numbers.

An additional development which has been concurrent with the mine development is the establishment of the Checkerboard Health System, which is centered in Cuba. This system serves the Navajo area as well as the residents of Cuba and environs. Taken together, the school and the clinic have provided 145 new jobs since 1970.

IMPACT ON PEOPLE

The impact of mining development on people may be viewed from many perspectives. Changes in population, in level of employment, and in personal income are examined here. Each reflects one important facet of a socioeconomic system that is complex even in a population of less than 2,000 people.

Population

Since census data are collected only once per decade, some alternative means of estimating the population increase had to be devised. Electricity was used by virtually all households in 1970 and has been extended to all newly occupied residencies since. Therefore, the number of electricity meters was selected as the best indicator of population change. All of the study area was serviced by Jemez Mountains Electric Cooperative, which provided the data (table 2).

There were 230 new electricity hookups in the whole area, an increase of 45 percent during the 4-year period. Assuming household size remained constant, the population was estimated to have increased a like proportion from the 1970 census figures. This resulted in an estimated population of 1,890 for the entire area and of 1,270 for Cuba with its adjacent and outlying areas. The latter grew faster (55 percent) than did La Jara, Regina, and the distant outlying area (29 percent).

Employment

Employment by industry for 1970 and 1974 is given in table 3. Major changes took place in mining, health, and public education; all other changes are quite small by comparison. The figures for 1974 may be underestimated in some cases, since 1970 figures were increased only where there was evidence of a change, e.g., a new business. Employment increased by about 278 (73 percent) over 1970.

The seasonal variation in male employment is shown in table 4. The additional mine, school, and medical employment has stabilized male employment by diversifying it and providing a year-around base. The seasonally employed have been reduced from 33 to 19 percent. In addition to the seasonal fluctuations there are cyclical fluctuations. In late 1974, the lumber industry was facing severe difficulties due to the slump in housing construction. The sawmill was reduced to a skeletal operation, and local loggers were either unemployed or had gone elsewhere for work. The copper industry is also subject to cyclical fluctuations.[4]

Table 2. Population change as estimated from the change in the number of electricity users, Cuba Area, New Mexico, 1970-1974

Sub-Area	Electricity Users		Estimated Population	
	1970[a]	1974[b]	1970[c]	1974[d]
	number			
Village of Cuba	177	228	453	584
Adjacent area	84	168	215	430
Outlying area	59	100	151	256
Sub-totals	320	496	819	1270
Change (%)	176 (55)		451 (55)	
La Jara	142	182	363	466
Regina	[23]	30	59	77
Outlying area	[23]	30	59	77
Sub-totals	188	242	481	620
Change (%)	54 (29)		139 (29)	
Total area	508	738	1300	1890
Total change (%)	230 (45)		590 (45)	

Sources: [a]Personal communication with Marie Wingo, Office Manager, Jemez Electric Cooperative, Cuba, New Mexico. Data in brackets were estimated on the assumption that these areas changed in the same proportion as La Jara, the nearest locality for which data were available.

[b]Data provided by same source as in (a), for the number of users of November, 1974.

[c]The 1970 census population of the Cuba area, 1300, was apportioned among the sub-areas listed on the basis of the ratio of total population to total number of users of electricity, 2.56. This ratio was multiplied by the data in column (a) to arrive at the estimates given in column (c).

[d]Same method as in (c), but the ratio 2.56 was multiplied by the data in column (b). This assumes that the ratio of population to users did not change from 1970 to 1974.

[4]Due primarily to falling copper prices, mine operation was suspended indefinitely in December 1974 while this publication was in preparation.

Table 3: Average employment by industry for Cuba, La Jara, Regina, and adjacent areas, 1970 and 1974

Industry	1970			1974		
	Male	Female	Total	Male	Female	Total
Agri. and forestry (incl. logging)[a,c]	74	0	74	74	0	74[a,c]
Mining[a,e]	5	0	5	137	3	140[a,e]
Construction[a]	12	0	12	12	0	12[a]
Sawmill[d]	45	0	45	45	0	45[a,b]
Utilities, san. services[a]	14	4	18	14	4	18[a]
Wholesale and retail trade[a,b]	65	26	91	72	33	105[a]
Banking and credit[g]	3	9	12	3	7	10[g]
Domestic workers[a]	0	6	6	0	6	6[a]
Health services[f]	2	3	5	15	41	56[f]
Public education[a,h]	27	39	66	61	84	145[a,h]
Other education[a]	0	10	10	0	10	10[a]
Welfare, religious, etc.[a]	14	4	18	14	4	18[a]
Public administration[a]	6	14	20	6	14	20[a]
Total employment	267	115	381	453	206	659

Sources: The employment data collected and/or estimated was derived from information from a variety of sources, including the following:
(a) 1970 Census of the Population (8)
(b) A list of licensed businesses operating in Cuba, provided by Alex Pitts, Village Councilman.
(c) Ramco Logging Company, Cuba Office
(d) Jack Forwoodson, Duke City Lumber Company, Cuba Office
(e) Earth Resources Nacimiento Copper Mine, Cuba
(f) Jackie Sturdevant, Checkerboard Health Center, Cuba
(g) Bill Humphries and Esther M. Martinez, First State Bank, Cuba
(h) Melvin Cordova, Superintendent of Schools, Cuba

Table 4. Employment in the male labor force, by seasonality and industrial sector, for Cuba, La Jara, Regina, and adjacent areas, 1970 and 1974.

Industry	1970			Employment Change	1974		
	Min	Avg	Max	1970 to 1974	Min	Avg	Max
Mining	5	5	5	132	137	137	137
Sawmill industry[a]	31	97	119	0	31	97	119
All other	165	165	165	54	219	219	219
Total	201	267	289	186	387	453	475
Seasonal fluctuation as percentage of average employment		$\frac{289-201}{267}$ = 33%				$\frac{475-387}{453}$ = 19%	

[a]The primary seasonal activities are sawmill and logging. The minimums for these industries assume that the sawmill is fully active, on average, 90% of the year, and that logging is fully active 75% of the year. This figure is probably an upper limit for seasonal unemployment since many of those seasonally unemployed do migrate.

Sources: Same as table 3.

Income

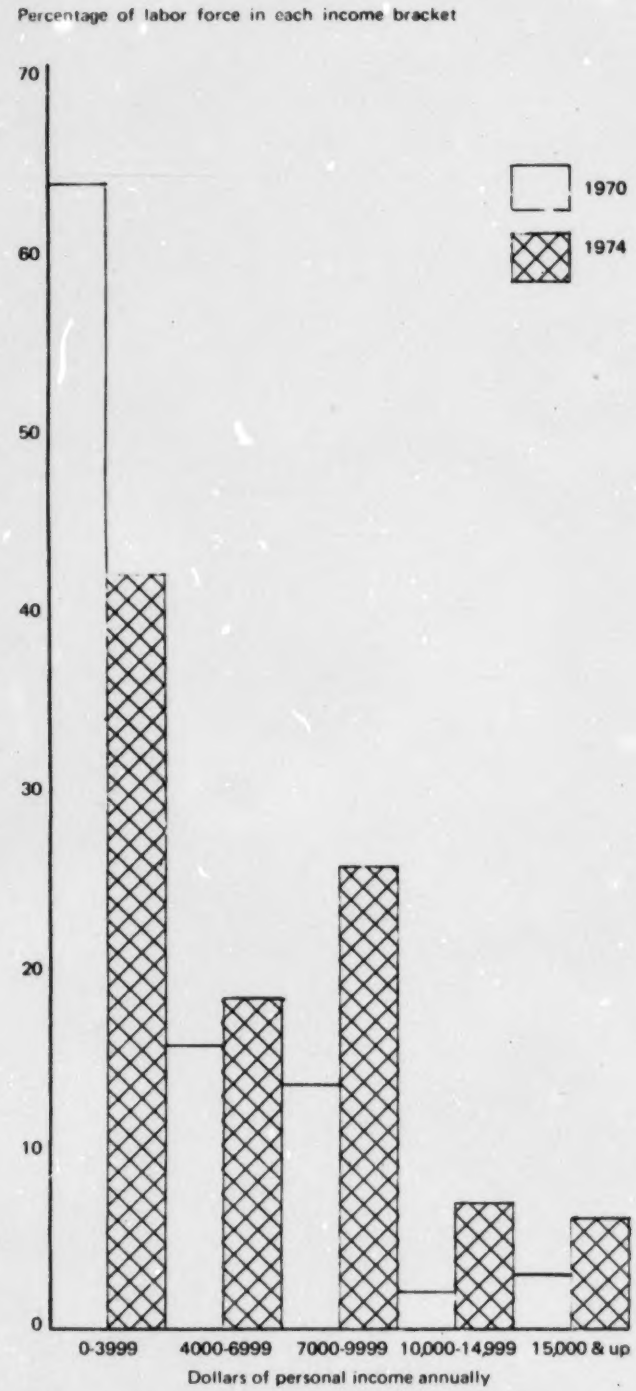
The people of the Cuba area have experienced not only a substantial in-migration and a considerable increase in employment but also significant changes in personal income (figure 5). Most new workers were relatively highly paid by local standards, and their appearance has increased average incomes. No data were available to indicate whether wage rates of pre-1970 employees had improved or not.

IMPACT ON BUSINESS

Business Activity

The growing and more prosperous population of the Cuba area has had a marked effect on business activity in Cuba. Gross receipts, the sales reported to the state Bureau of Revenue for tax purposes, were selected to indicate business activity. Gross receipts data for Cuba were not available until the 1969-70 fiscal year. In that

Fig. 5. Estimated personal income distribution in the Cuba area, 1970 and 1974



Source: The 1970 figures were taken from U. S. Census of population (8). The 1974 figures were estimated by adjusting 1970 figures to include the incomes of new workers.

year Cuba began collecting the additional one percent sales tax earmarked for community use.

Figure 6 presents monthly and average monthly gross receipts for the five-year period beginning with fiscal year 1969-70. These figures do not include sales of gasoline, since data were not available over the entire period. (Gasoline sales in Cuba have been over one million dollars annually for the past two years.) Gross receipts averaged $3.78 million during the past four years, a gain of $2.37 million (168 percent) over 1969-70. (This figure is slightly exaggerated by the inflation which occurred during that period.)

The monthly data accent the fluctuations in local business activity. It appears that a normal year is characterized by lows centered around February and March, and highs around November. The winter lows reflect the off-season for logging, while the November highs reflect hunting seasons in the nearby forest. The sharp increase began in July 1970, following the beginning of the copper mine construction phase, which ran from May, 1970 to May 1971. Construction employment peaked at 225 to 250 men. In May, 1971, the mine became fully operative with approximately the present 135 employees.

Nearly concurrent with but independent of the mine construction was the reconstruction of State Highway 44 through Cuba. The old two-lane highway was widened into a divided four-lane complete with street lighting, a change which brought a new face to the village. The construction employment for the highway peaked at about 80 men. Other local construction during the period included school facilities, a federal office building, several new or rebuilt businesses, residential construction, and enlargements of the water and sewage systems.

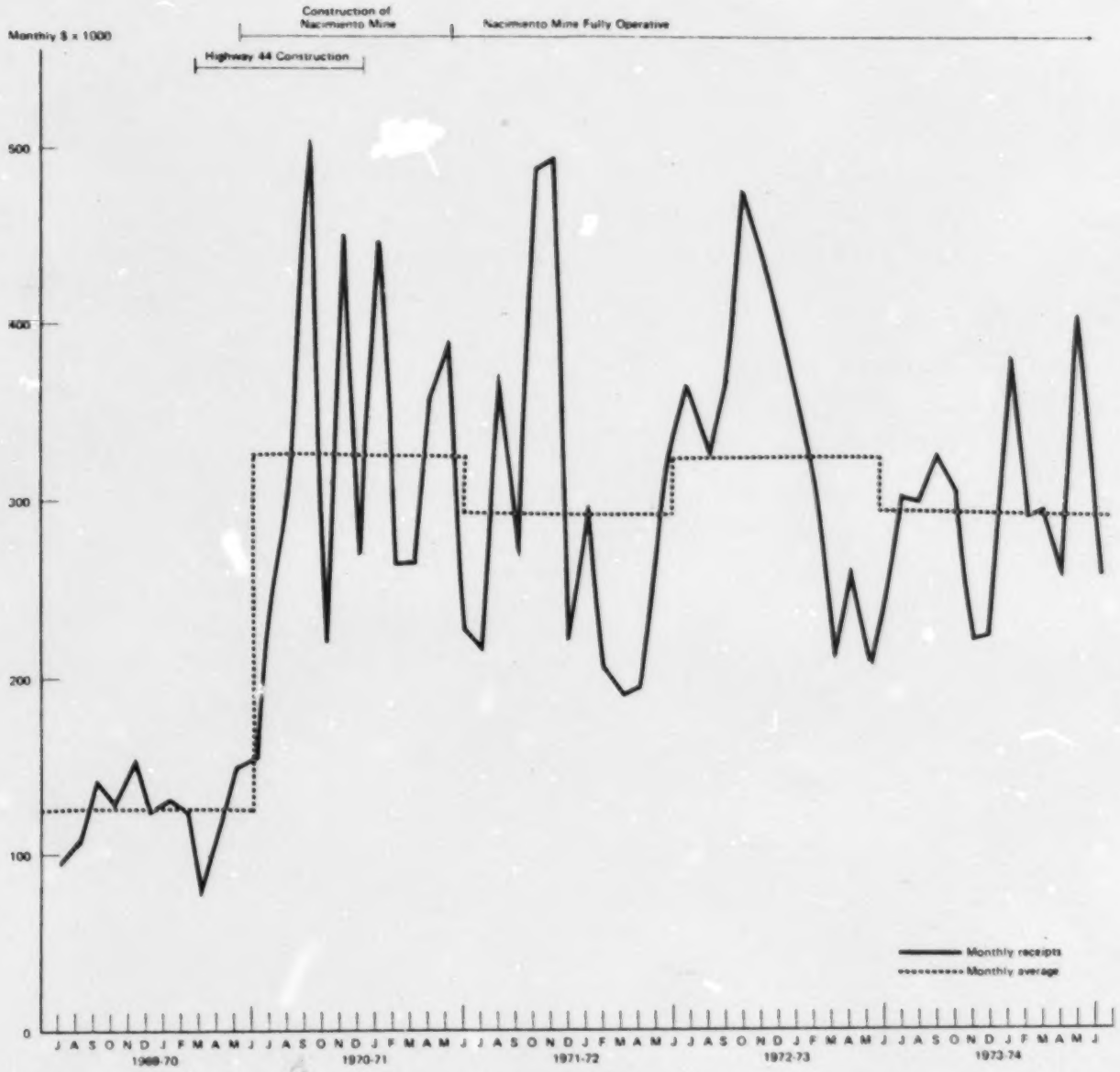
Logging and recreation were affected by bad weather in 1971-72, and that, with the fuel shortage in 1973-74, may account for the $35,000 drop in average monthly gross receipts for those two periods.

The increase in local industrial payrolls helps explain the $2.37 million increase in gross receipts which took place after 1969-70. Table 5 provides the estimated total payrolls for the major local industries. These payrolls increased an estimated $2.4 million over their 1969-70 levels, which matches the $2.4 million increase in gross receipts over the same period.

New Businesses

As a result of its new prosperity, Cuba has seen several new business enterprises established, and

Fig. 6. Gross receipts by month and monthly average for each year, Cuba, New Mexico, fiscal years 1969-70 through 1973-74[a]


Monthly $ x 1000
Construction of Nacimiento Mine
Nacimiento Mine Fully Operative
Highway 44 Construction
500
400
300
200
100
0
Monthly receipts
Monthly average
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J
1969-70
1970-71
1971-72
1972-73
1973-74

[a]These estimates are based on State Tax records for the Village of Cuba. Taxable receipts were multiplied by a factor of 1.44 because gross receipts for Sandoval County averaged 144% of taxable receipts due to deductions. Gasoline sales are omitted due to inadequate data.

Source: Data base supplied by John Romero, Tax Research Division, New Mexico Bureau of Revenue; excludes gasoline sales.

Table 5. Payrolls for local industries, Cuba, New Mexico, 1974

Industry*	Payroll 1970	Payroll 1974	Estimated Change 1970 to 1974	Changes as Percent of Total Change
	dollars per year			
Copper mining[a]	0	1,500,000	1,500,000	63
Education[b]	600,000	1,020,000	420,000	18
Medical[c]	25,000	480,000	455,000	19
Sawmill[d]	275,000	275,000	---	---
Logging[e]	125,000	125,000	---	---
Total	1,025,000	3,400,000	2,375,000	100

*Not all of those employed in each industry live in the study area; about 20 percent of the medical industry employment lives outside the area, as do about half of the loggers. Sawmill and logging figures represent estimated payrolls for normal years during this period. The depressed condition of the sawmill industry probably held down wage increases over the period.

Sources: Personal communications with the following:

[a]Keith Elmer, Personnel Manager, Nacimiento Copper Mine, Earth Resources Company, Cuba, New Mexico

[b]Melvin Cordova, Superintendent of Schools, Cuba, New Mexico.

[c]Jackie Sturdevant, Administrator, Checkerboard Health System, Cuba, New Mexico.

[d]Jack Forwoodson, Duke City Lumber Company, Cuba Office, Cuba, New Mexico.

[e]Ramco Logging Company, Cuba, New Mexico.

Table 6. Business enterprises, present and new or expanded since 1970, Cuba, New Mexico, 1974

Tyoe of Business	1974	New or Expanded Since 1970[a]
	number	
Drinking establishment	7	1
Hardware and department	2	2
Auto parts and services	8	1
Oil distributors	4	
Service stations	11	2
Beauty and barber	4	
Clothing	1	1
Foodstores	6	1
Motels	5	
Eating establishments	5	1
Trailer courts	4	
Industrial	6	
Amusement	2	
Laundry and cleaners	3	
Cosmetic retailers	4	
Medical practice, private	1	
Drug store	1	
Second hand and gift	3	
Insurance agency	1	1
Miscellaneous	11	
Total	89	11

[a]This tabulation includes as new those businesses which existed previously but which were rebuilt, and those which underwent substantial changes, e.g., a foodstore which remodelled and added package liquor sales.

Source: List of licensed business, Cuba Village Council, and Esther M. Martinez, Assistant Cashier, First State Bank, Cuba, N. M.

several old businesses substantially improved or rebuilt (table 6). Several others have built new facades in recent years. Perhaps the most outstanding examples are a new Western Auto store (figure 7), an insurance agency, a new restaurant, and a new building for the fashion shop.

Bank Resources

Cuba's bank resources have increased, mostly since June 30, 1971, lagging the increases in gross receipts by about one year (table 7). Bank resources have increased by 39 percent since 1971. This increase reflects in part the growing number of business loans and home mortgages, which include many for mobile homes and lots.

Mining Impact on Other Industry

The Nacimiento Copper Mine has had a limited effect on other local industries. The large number of new, relatively well-paid, job opportunities at the mine did increase the turnover in the sawmill industry for six to eight months after the mine became operational. Many of the in-migrants associated with the mine development probably actually found jobs with the sawmill industry, replacing workers who had switched to the copper mine. The mine's policy of hiring locally, as they did, was still probably the primary cause of population growth in the area during this period.

Other inter-industry effects of the mine development are seen in recent agricultural developments. The new prosperity made it possible for some

Fig. 7. A new Cuba business

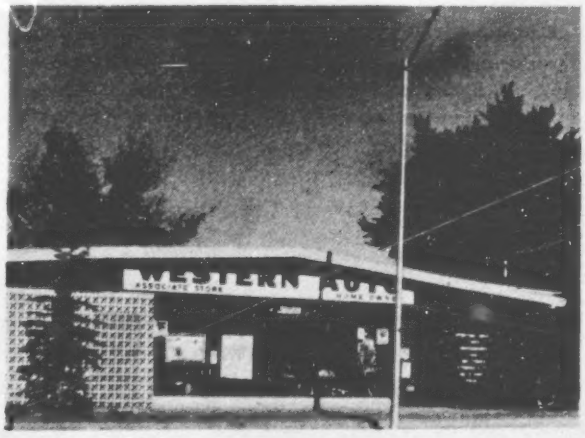


Table 7. Bank resources, Cuba, New Mexico, 1965-74

June 30 of Year	Total Resources[a]	Annual Change
	dollars	percent
1965	1,485,500	—
1966	1,493,200	+0.5
1967	1,501,700	+0.6
1968	1,564,400	+4.2
1969	1,685,900	+7.8
1970	1,708,100	+1.3
1971	1,694,300	-0.8
1972	1,896,400	+11.9
1973	2,286,400	+20.6
1974	2,356,800	+3.1

[a]Resources of Cuba Investment Company, which handles primarily small loans, are not included.

Source: Esther M. Martinez, Assistant Cashier, First State Bank, Cuba, New Mexico.

people to invest in farming or ranching. The workers have a little extra money to improve small holdings. These investments have taken the form of improvements to real estate, new equipment, and livestock. The water used by the mine does not diminish irrigation water. Nor has the supply of farm labor been much affected by mine labor requirements. Mine labor is so much better paid than ranch labor as to constitute a separate labor market.[5]

IMPACT ON COMMUNITY SERVICES

When substantial industrial developments occur in relatively small communities, local businesses usually prosper. Community services, however, are usually subjected to considerable strain. Municipal services are frequently inadequate, and necessary expenditures exceed revenues, causing municipal indebtedness to rise to dubious levels. In addition, a community may not be able to cope with rapid increases in the demand for medical and educational services, housing, and transportation facilities. Cuba, however, has done reasonably well in these regards.

[5]Personal communication from a local rancher.

Municipal Services and Finances

Municipal expenditures for selected activities over recent years are shown in table 8. These expenditures have more than tripled since 1970. The major areas of change have been in administration, police protection, streets, and sewage and water systems.

In the areas of administration, most increases reflect purchases of office machines and equipment. During 1972 and 1973, local police protection was extended to 24 hours daily, requiring two additional policemen. A state patrolman and a sheriff's deputy have also been added to the community since 1970. Reports indicate that law enforcement is not only improved and sufficient, but could handle additional growth. Increases in expenditures in these two areas account for over two-thirds of the total increase shown in table 8.

Although fire protection expenses have not increased sharply, the volunteer fire department has been improved. The chief, who is the local deputy sheriff, meets regularly with approximately 40 volunteer firemen, 12 of whom have been through a two-week training course. They have two pumpers with a total capacity of 1250 gallons. Recent acquisitions include complete bunker suits and tools.

Table 8: Municipal expenditures for selected activities, from 1969 to 1974, Cuba, New Mexico

Activity	Fiscal Year Ending June 30 of Year—					
	1969	1970	1971	1972	1973	1974
	dollars					
Administration	14,226	8,716	4,280	11,329	15,639	35,074
Police	7,339	7,687	8,309	16,052	25,290	44,035
Fire	14,924	11,469	9,518	13,145	5,552	7,842
Streets	0	0	2,626	7,401	18,609	11,300
Sanitation	0	5,989	875	3,104	3,042	3,460
Recreation	1,489	1,050	2,168	3,384	2,958	2,018
Sewage system	0	0	10,843	8,652	12,340	13,380
Water system	0	0	0	0	0	11,453
Totals	37,978	34,911	38,619	63,067	83,430	128,362
Index (1970 base)	1.09	1.00	1.11	1.81	2.39	3.68

Source: Annual Reports of the Local Government Division, New Mexico Department of Finances and Administration, Santa Fe, New Mexico.

New expenditures on streets have mostly been related to maintenance of the new four-lane thoroughfare, State Highway 44 (figure 8). They include the cost of operating and maintaining street-lighting and a new street sweeper, which was purchased in 1973. The community sewage system, funded through municipal revenue bonds in 1968, did not become operative until 1970. The system was overloaded almost from the beginning as the sewage lagoons were not large enough for the growth which occurred from 1968 to 1970. The Environmental Protection Agency has recently made a grant to Cuba for either installing a treatment plant or building new larger lagoons.

The water system was acquired by the village in 1974 from a local, privately owned association. The Farmers Home Administration (FHA) made this possible through a $900,000 loan. Water is of poor quality and attempts to improve it or secure another source have not been successful. The old chemical treatment plant is highly inadequate. A new filtration plant and two new storage tanks were planned, to be financed with a combination of municipal bonds, grants from other agencies, and the FHA loan. A new, deeper well was also being considered. Numbers of residential water users are shown in table 9. Numbers of households with system water lag behind those with electricity 285 to 496 (table 2), for several reasons. Principal among these have been poor water quality, limited system capacity, and a more localized service area.

Table 9. Number of residential water users, Cuba Municipal Water System, 1968 to 1974

Year	Residential Water Users at End of Year
	numbers
1968	155
1969	172
1970	190
1971	212
1972	240
1973	259
1974	(285)[a]

[a]As of October, 1974
Source: Murphy Brasnel, Utilities Operator, Cuba, New Mexico.

Municipal revenue has increased steadily to nearly four times the 1969 level, as shown by general fund receipts for Cuba (table 10). The largest increase has occurred through the state gross receipts tax; one quarter of the four percent tax is returned to the municipalities in which it was collected. Better than any other indicator, it shows the dramatic increase in Cuba's business activity. Other large increases occurred in gasoline tax revenue, and in police fines and fees. The latter have increased primarily due to the establishment of 24-hour police protection, the use of radar in speed-law enforcement, and the new four-lane thoroughfare. The increase in franchise tax collections in 1970 was due to a change from a system of

Fig. 8. Cuba's principal thoroughfare

Table 10. Municipal receipts, general fund, 1969 to 1974, Cuba, New Mexico

Source of Revenue	Fiscal Year Ending June 30 of—					
	1969	1970	1971	1972	1973	1974
	dollars					
Property tax	1,000	1,000	1,000	1,000	1,000	1,000
Gasoline tax	14,031	27,423	34,722	28,583	34,148	27,710
Gross receipts tax	NC	9,001	27,079	24,113	28,417	24,695
Franchise tax	300	1,243	1,655	1,642	2,602	2,469
Cigarette tax	2,759	3,256	4,047	3,549	3,906	4,218
Occupation licenses	522	828	876	988	1,043	898
Liquor licenses	1,250	1,563	1,518	1,653	1,675	1,705
Police fines and fees	913	1,216	912	5,574	9,001	9,911
Auto licenses	2,426	925	3,696	4,964	5,533	5,785
Other	36	117	135	137	137	1,446
Total general fund	23,237	46,632	75,640	72,203	87,462	87,637

Source: Annual Reports, Local Government Division, New Mexico Department of Finance and Administration, Santa Fe, New Mexico.

NC = Not collected.

straight fees to a sales-based system. New water utility connections in the new housing area also account for some of the increase in franchise tax collections since 1970 (the water system was private until 1974).

In addition to state and local sources of revenue, the community has benefited from several sources of federal funding. They include the FHA loan and EPA grant (discussed above), revenue sharing funds, emergency employment funds (PEP program), and federal money in various forms to the school system and health system. Without these, the community would surely have been hard-pressed to meet the demands of the recent developments. Cuba's cash balances have remained in the black throughout this period. Municipal indebtedness includes the sewer bond issued in 1968, of which $76,500 is outstanding, and the very recent FHA loan of $900,000 for the water system.

Private Services

In 1970, housing was tight, with no vacancies reported in the 1970 Census of Housing [9]. When the mine opened, Earth Resources found it necessary to establish a mobile-home development for its professional staff. They are still living in these homes. This hillside development presently consists of 13 mobile homes. Other mobile-home sites and permanent homes are scattered around in the vicinity. In marked contract to many such developments, this one is aesthetically quite agreeable, with its spacious lots and interesting environment of pinon-juniper hillsides (figure 9). This area

Fig. 9. New mobile home area, Cuba, New Mexico

would be a prime location for future housing developments should Cuba experience more growth in the future.

In the fall of 1974, it was difficult to find permanent housing in Cuba, although mobile-home sites were available. Rents increased substantially since the mine opened, some as much as 100 percent, while mobile-home lot rentals increased about 50 percent. Some local people lived in houses, cabins, and mobile homes east of town, in the forest. Others lived in the La Jara and Regina areas to the north. The entire area has a rather scattered settlement pattern.

Village roads are mostly unpaved, with the exception of state highways. The new four-lane thoroughfare provides for the business strip. The nearest rail service is at Bernalillo some 60 miles away; bus service is provided by Continental Trailways. There is an unpaved airstrip suitable for small aircraft but no scheduled air service.

Medical Services

The Checkerboard Health System, with its central clinic in Cuba, provides medical services through several satellite clinics scattered about the region. The system is operated by Presbyterian Medical Service, which is headquartered at the Bernalillo County Medical Center in Albuquerque. The system is financed by money from many sources including municipal contributions, donations, and a large federal grant. The fee schedule is sliding, based on the patient's financial status. Though existing largely to provide service for Navajos in the Checkerboard Area, the system also serves local residents. It provides school nurse services, and physical examinations and emergency treatment for mine employees. One hundred physical examinations were pro-

vided mine employees initially, and approximately four are given monthly due to labor turnover.

The Cuba clinic has 10 hospital beds, one ambulance, and a four-wheel-drive off-road vehicle for backup. The staff of 70 includes three physicians, two dentists, four registered nurses, a physician assistant, and numerous practical nurses, assistants, and trainees. The average weekly load was about 675 patient calls in late 1974, and the staff was very busy. New physicians and support staff would be needed if the load were increased.

School System

The Cuba Independent School System includes an elementary school, a combined middle school and high school, and a vocational building. The elementary school is a modern open classroom set-up complete with video communications via satellite. The elementary school, the vocational building, tennis courts, and swimming pool were built since 1970. A new bond issue will provide for a new middle school, and there are plans for a new gynasium and a library.

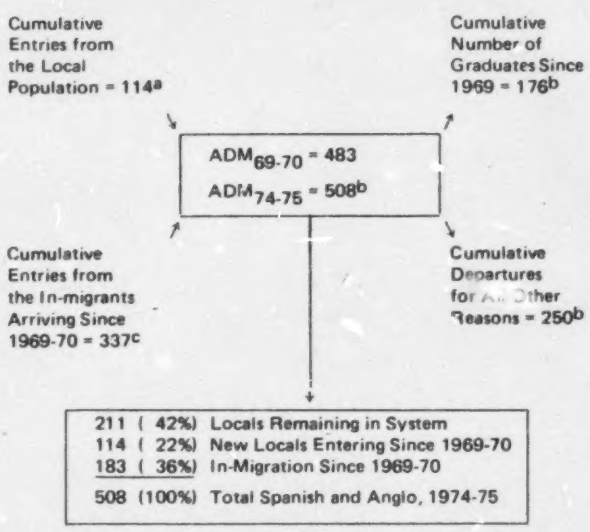
Although funding came from a variety of sources, school district ad valorem property taxes on the Nacimiento Mine made it possible to pass recent short-term school bond issues which can be retired by the early 1980s. Other revenue sources included the community, the school district, the county, the state, the Four Corners Regional Commission, the Federal Bureau of Outdoor Recreation, and specific federal grants.

The schools' average daily membership was about 1,015 in 1974, with an ethnic mix of approximately 50 percent Navajo, 30 percent Spanish-American, and 20 percent Anglo. There were 145 employees in the system, including 78 teachers. There was excess capacity in the system sufficient for about 100 students. The new middle school would create classroom capacity for an additional 300 to 400 students.

There is also a small parochial school with a stable enrollment of about 140 pupils. It is operated by four nuns who teach two grades each. Tuition varies from $5 to $9 per month according to the number of pupils per family.

The impact of recent developments on the school system were estimated from the non-Indian average daily membership. Nearly all Native-American students came from outside the area impacted by the mine. Figure 10 presents a schematic view of how the school system's average daily membership has changed since the 1969-70 school year.

Fig. 10. Five years of change in the Cuba Independent School System, Spanish and Anglo students, 1969-70 to 1974-75 academic year.


Cumulative Entries from the Local Population = 114[a]
Cumulative Number of Graduates Since 1969 = 176[b]
ADM_{69-70} = 483
ADM_{74-75} = 508[b]
Cumulative Entries from the In-migrants Arriving Since 1969-70 = 337[c]
Cumulative Departures for All Other Reasons = 250[b]
211 (42%) Locals Remaining in System
114 (22%) New Locals Entering Since 1969-70
183 (36%) In-Migration Since 1969-70
508 (100%) Total Spanish and Anglo, 1974-75

Sources: (a) 1970 Census summation of population aged 1-5 for estimation of locals who would be expected to enter system over this time.
(b) Personal communication from Melvin Cordova, Superintendent of Schools, Cuba Independent School System
(c) Cumulative in-migrants were derived using a flow balance: 508 = 483 + 114 + X - 176 - 250; gives X = 337.

*Navajos were excluded from these calculations since they were almost totally unaffected by the mine development and their school enrollment has remained constant.

These changes were due to the following: 1) the natural rate of entries due to children who were already living in the area was declining; 2) the number of students leaving the system—either graduating, moving, or dropping out for any other reason—was much greater than the natural rate of entries; and 3) the in-migration of new students more than made up for what would have been a natural decline in the number of Spanish and Anglo students. The resulting composition of non-Native American students is estimated to be 64 percent locals and 36 percent in-migrants. Many in-migrant students may be members of families who had been residents of Cuba at one time and returned since 1970.

The Nacimiento Mine is likely responsible for at least half of these in-migrants, directly or indirectly. So the mine accounts for about 18 percent of 1974 non-Native membership, or about 9 percent of total average daily membership.

ATTITUDES TOWARD DEVELOPMENT

Numerous groups were contacted to assess attitudes and concerns regarding developments in Cuba. Included were retirees, students, school administrators, teachers, industry officials, clergymen, ranchers, municipal officials, businessmen, and others. Most reactions to recent development were quite favorable, but some negative feelings and doubts did surface. Expressed concerns were that the scenery was being damaged, Cuba was becoming a boomtown, the cost of housing had increased, and the water and sewage systems were overtaxed. These negative aspects were countered by a recognition of several benefits. Very few opposed the mine's presence in Cuba. Nearly everyone saw benefits far outweighing the problems created. Professional personnel at the mine have had to cope with some of the inconveniences of living in a very small isolated village, and some family problems have occurred, apparently as a consequence. Quite possibly, this group has experienced the most difficult social problems.

Given their very favorable experience with recent developments, Cuba residents are quite receptive to new developments. Many know that the Nacimiento Mine is a relatively short-term employer. They recognize that something new will be needed to replace lost employment and to provide new jobs. Most favor development on the scale of that since 1970. Certainly most want an economically viable and dynamic community. Very few would favor rapid disruptive changes even if they were accompanied by large economic gains.

DISCUSSION AND CONCLUSIONS

A substantial amount of quantitative data has been presented; much more could have been assembled. Each table provides a concrete measure of a particular dimension of the mine impact on Cuba. However, there is no formula for combining the disparate measures into one overall indicator of community development or social well-being. The individual indicators can only contribute to a qualitative interpretation, an informed judgment of the situation.

Development Was Orderly and Beneficial

The Nacimiento Mine development in Cuba had a textbook quality of orderliness with benefits for most of the directly affected parties and minimal inconvenience for a very few. Most of the labor force was hired locally. The technical and professional people who came in were capable and effective. An aesthetically pleasing new housing area was developed by the company in response to a critical need. The company has not gotten involved in local politics.

Community spirit and cohesiveness were high. Good examples of this are the Checkerboard Health Clinic and the new swimming pool. A number of local people worked very hard to help obtain funding for both projects. Cuba has supported a farsighted school administration which has been able to anticipate expansion, and to plan for and build new up-to-date facilities in an orderly fashion. Businesses have prospered. This is reflected in the new buildings and facades which give the new thoroughfare a very dynamic appearance. It is also evident in the increased gross receipts. Cuba generally gives the feeling of being a viable and progressive village.

Community Leaders Must Look Ahead

Communities must be alert in anticipating service needs and vigorous in providing them as they are needed. This sounds obvious enough but it requires generous amounts of foresight and boldness, characteristics not always encouraged or rewarded among city councilmen and county commissioners. Cuba's Village Council could emulate the school administration in anticipating and providing for service needs. Water and sewage were the most pressing problems in 1975, but all services merit constant attention and improvement. Also, should the population continue to grow, planning and perhaps some zoning will become necessary for orderly development.

Orderliness Depends on Development Rate

There is a maximum feasible community growth rate, which, if exceeded, leads to deterioration in services and quality of life. A precise maximum rate cannot be specified, but some useful ballpark figures can be suggested.

Cuba has handled a 55 percent growth with a minimum of disruption. A contrasting "textbook" example illustrates the problems of the other extreme. Rock Springs, a small city in southwestern Wyoming, more than doubled its population to 26,000 from 1970 to 1974 [4]. This resulted from the decisions of at least six major corporations to build or expand operations in the Rock Springs area, almost simultaneously. A housing crisis quick-

ly developed, services facilities became overcrowded, and the social fabric began to deteriorate as indicated by increased prostitution and alcoholism. The city had not, and probably could not have, anticipated growth on that scale. Service facilities were expanded only after the system was in chaos.

There were many differences between Cuba and Rock Springs. Each has a unique set of characteristics which limit generalizations from its experience. However, the evidence suggests that with planning and vigorous action by community leaders a town can absorb a 50 percent increase in population over a short period without serious disruption or deterioration in the quality of life. Doubling the population over a short period can be very disruptive.

The Star Lake Coal Field seems to have sufficient coal deposits to employ 700 or even more men for a substantial time. It was estimated that economically feasible mines could come in units requiring no more than 350 employes.[6] Two such mines would exhaust the known feasible (with current technology) reserves in a normal depreciation life span of mine equipment.

Any mine developed on Navajo lands (even contested ones) might be expected to be required by leasing agreement to hire 50 to 60 percent Navajo workers. These workers would probably continue to live in the Checkerboard Area even though they obtain most of their services in Cuba and other centers as they are now doing.

Most of the 300 to 350 non-Indian workers required by maximum development would probably choose to live off the Checkerboard Area, in or around Cuba. Together with their families and accompanying service and business people, a new labor force of this size would nearly double the size of Cuba. If this were to occur in a short time, Cuba could expect to become another Wild West boomtown, a la Rock Springs. On the other hand, if only one mine employing 350 in total were developed, Cuba might expect 140 to 175 new workers. This number together with families and others would lead to population growth of roughly 500. The evidence indicates that Cuba could absorb 500 new residents with a minimum of disruption. However, even at this pace, the mining company might expect to underwrite some critical services at first. After three to five years, the village might be ready to absorb another 500 in an orderly fashion, especially if coal mine development coincides with the termination of the copper mine.

[6]Many variables influence the size of an economically feasible mine such that the subject is very technical and complex. Careful investigation into the matter indicates this to be a realistic figure for present purposes.

Companies Share Development Responsibility

Companies planning capital expansions and or new developments should also anticipate and take into account community services required for an expanded population. They should be willing to help underwrite service expansion in some cases. For example, any company anticipating development in Cuba or a similar community, could expect some strains to occur in services with only a 50 percent increase in population, the community would need short-term help in developing adequate new services or facilities. With large and abrupt developments, the company should bear more responsibility for service expansion since it controls the decisions. The amount required is directly proportional to the abruptness and relative magnitude of the development. During gradual smaller developments, communities might be expected to take care of their own needs.

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